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Mitchell

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(54) **BOW-TYPE SOFT PROJECTILE LAUNCHER**

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F41B 11/14 (2006.01)

(52) **U.S. Cl.** **124/67**; 124/56; 124/63; 124/66

(58) **Field of Classification Search** 124/60, 124/63–67

See application file for complete search history.

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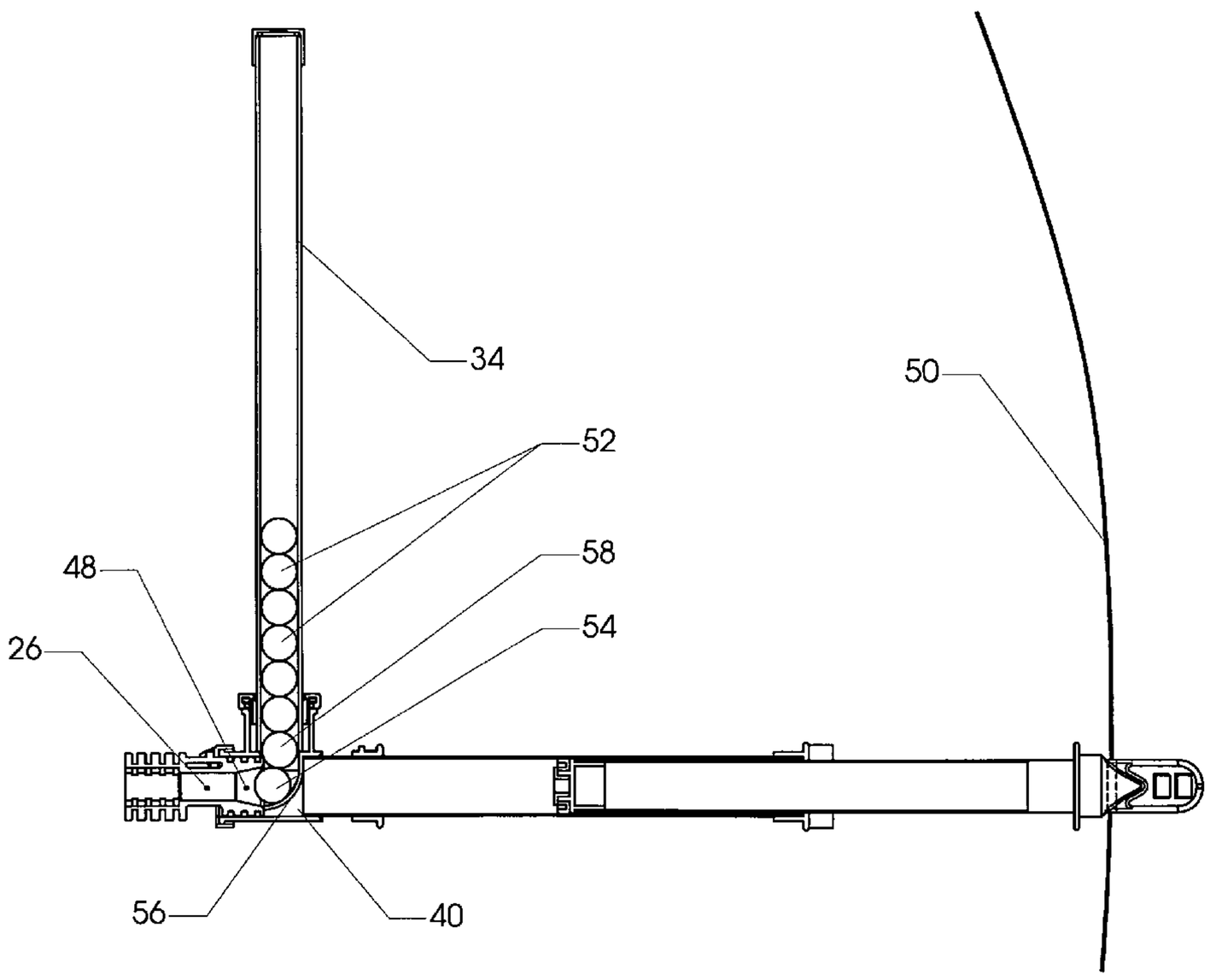
(57) **ABSTRACT**

A projectile launcher for launching soft projectiles. The projectile launcher features a pump assembly having a cylinder and piston. The piston includes a pump grip so that a pressure charge is generated when the user moves the piston. The pressure charge is released into a chamber which contains a soft projectile. The chamber includes a radius bend joining a projectile receiving orifice to a projectile discharging orifice. The pressure charge is introduced proximate the apex of the radius bend.

20 Claims, 7 Drawing Sheets



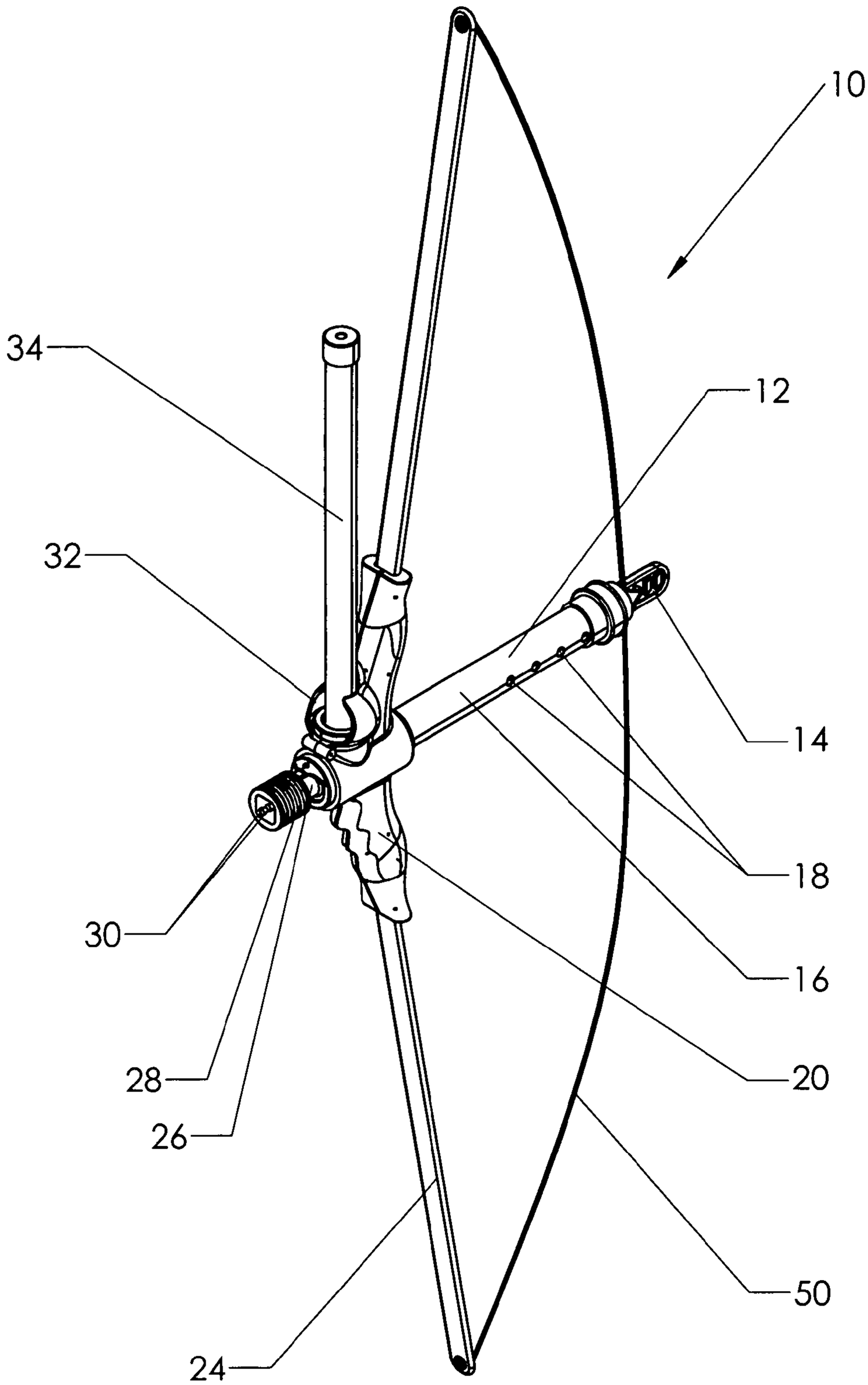


FIG. 1

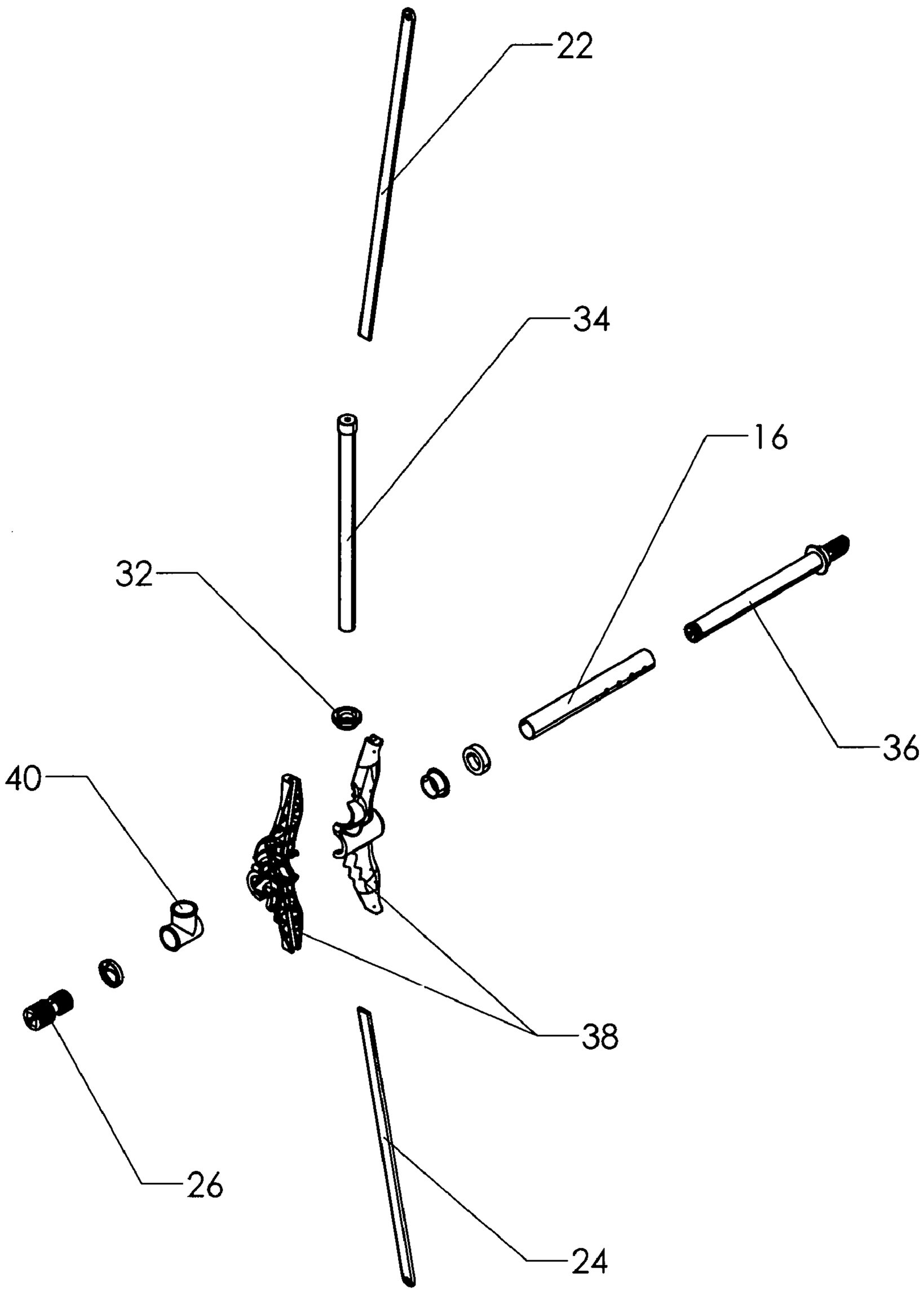


FIG. 2A

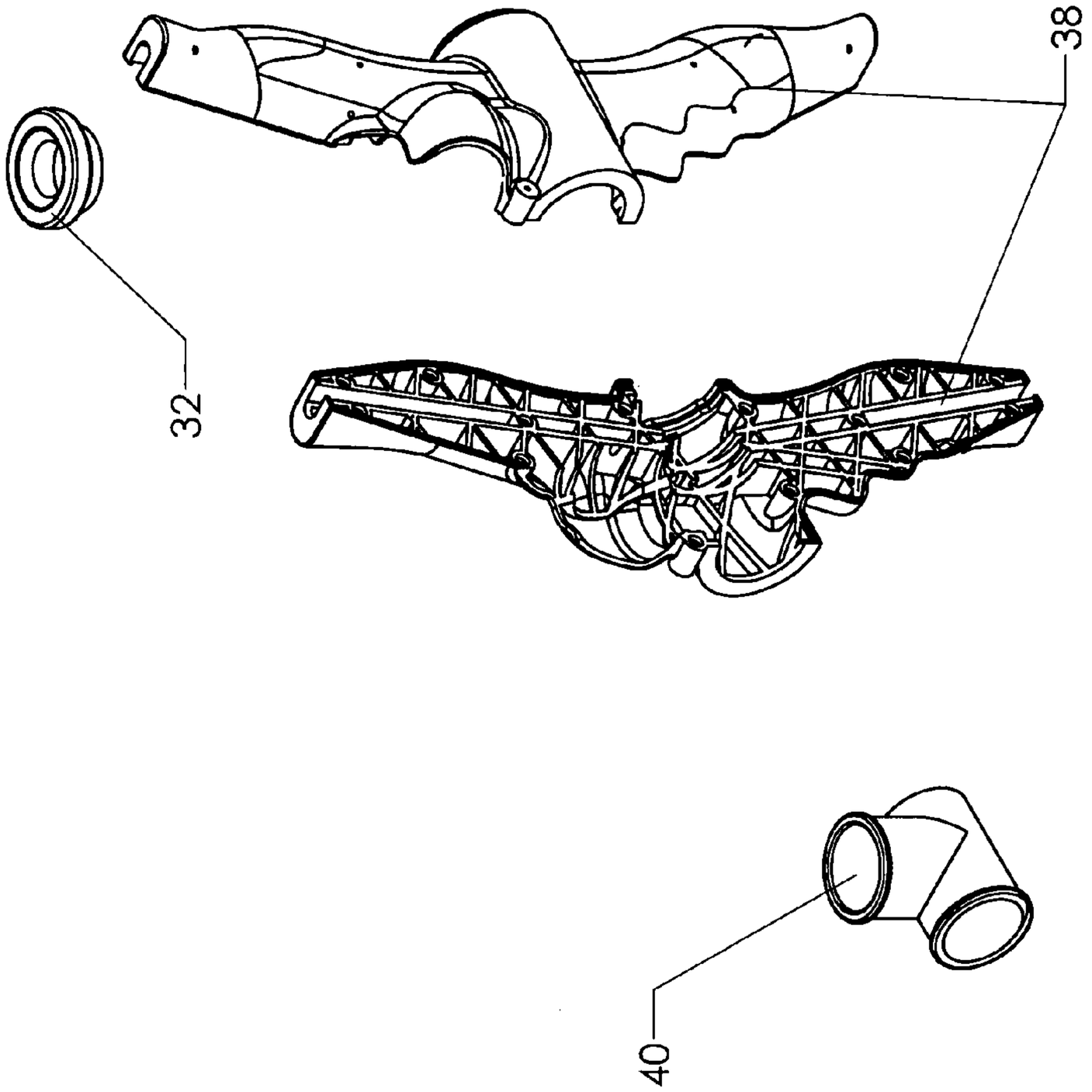


FIG. 2B

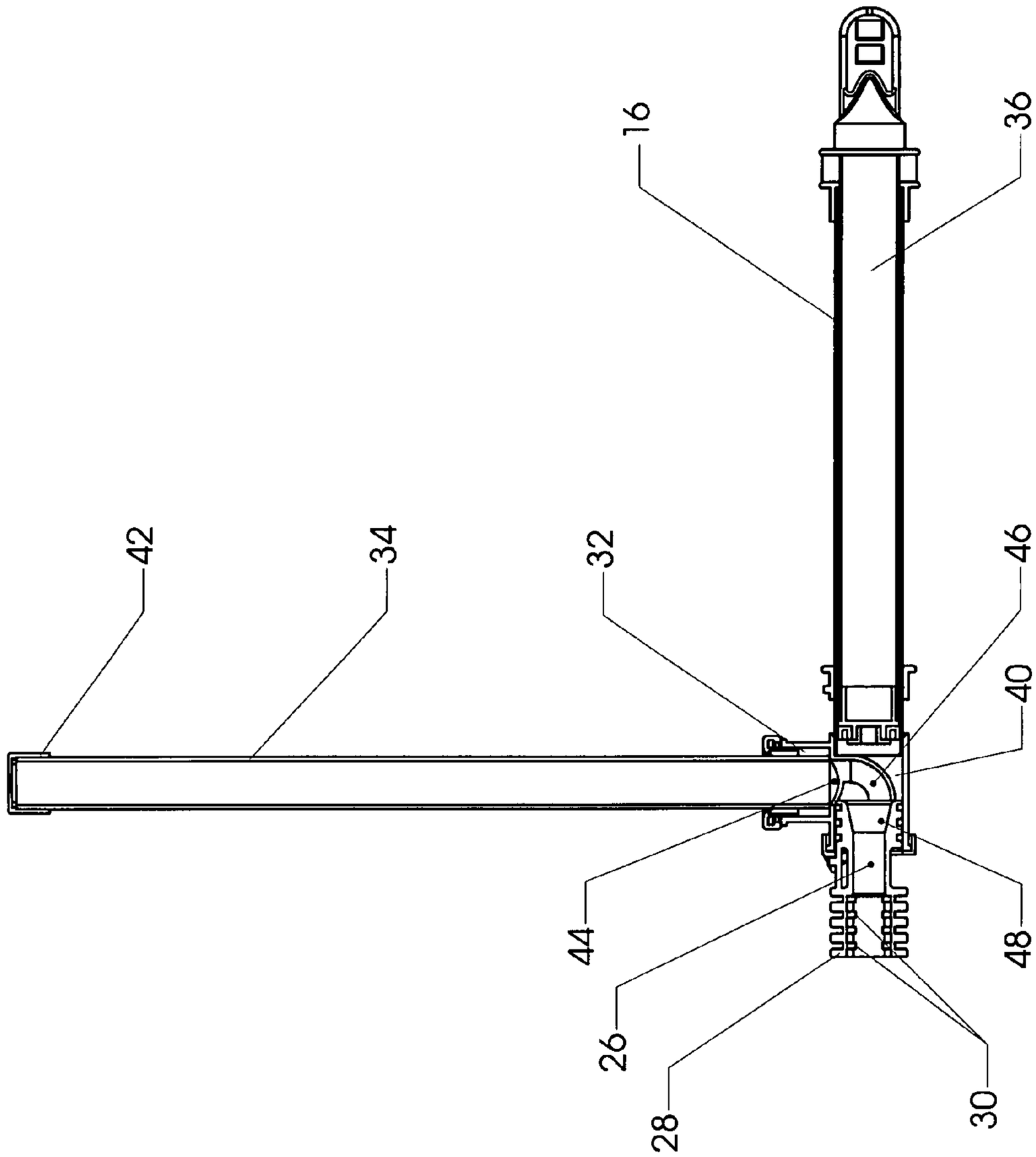


FIG. 3

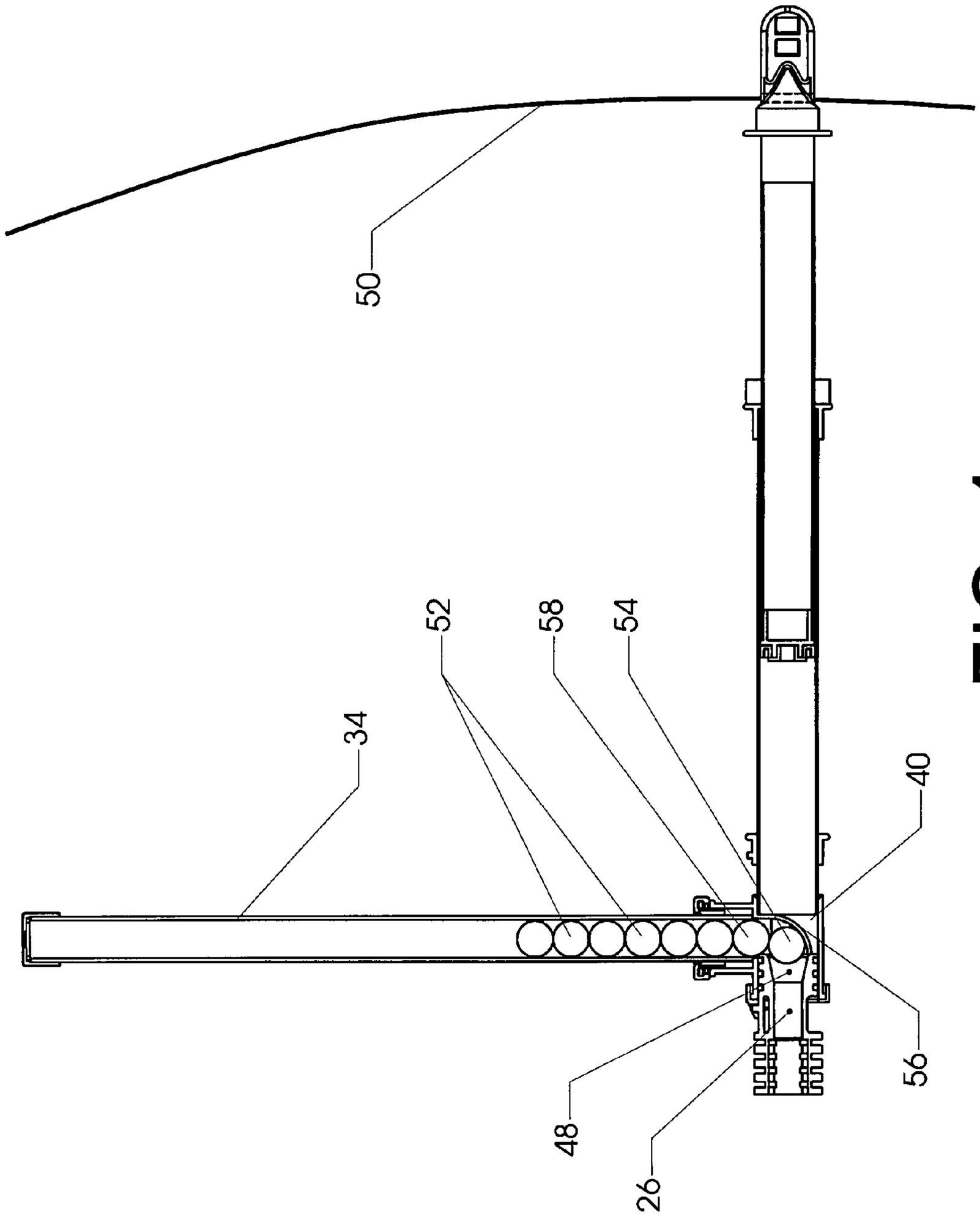


FIG. 4

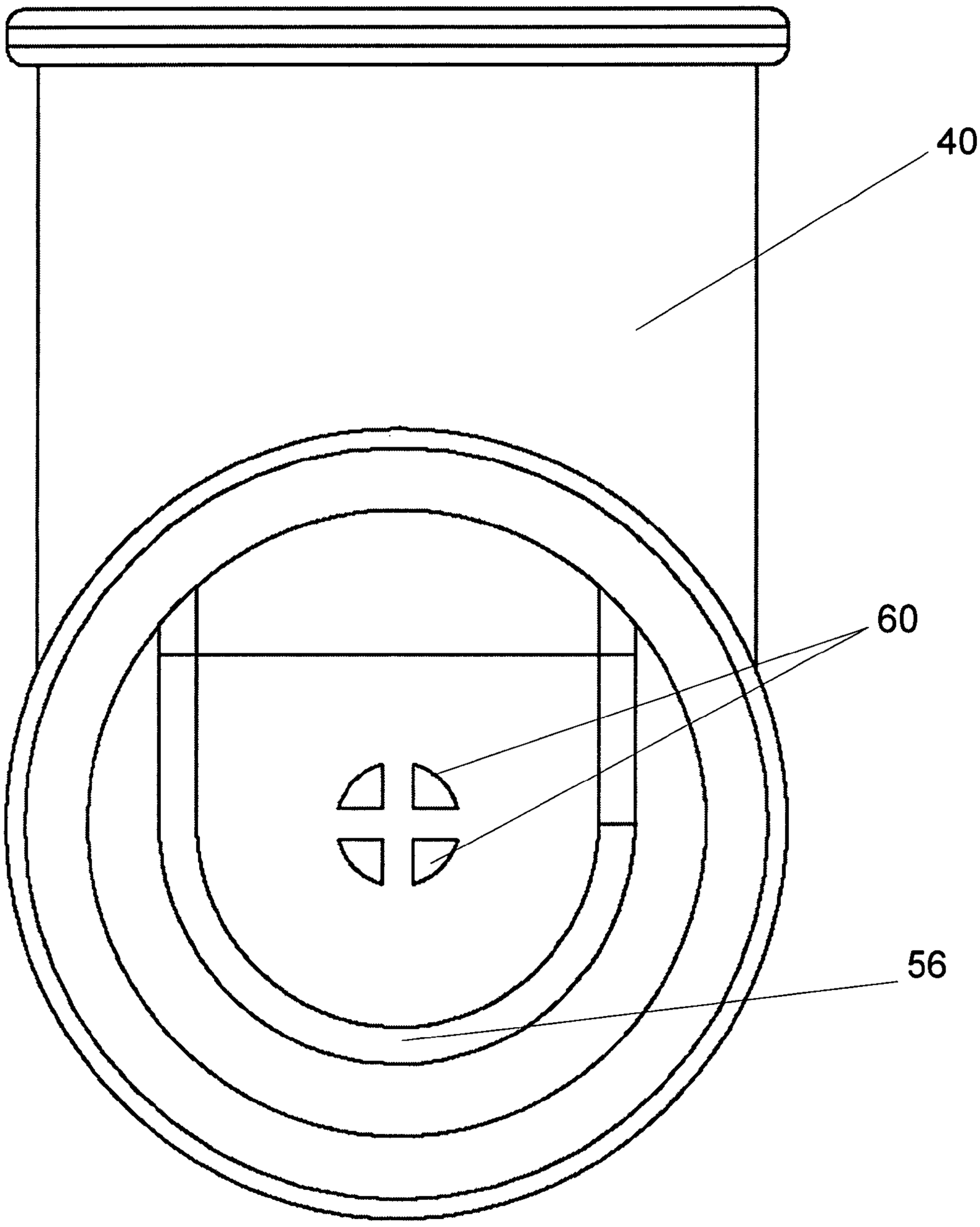


FIG. 5

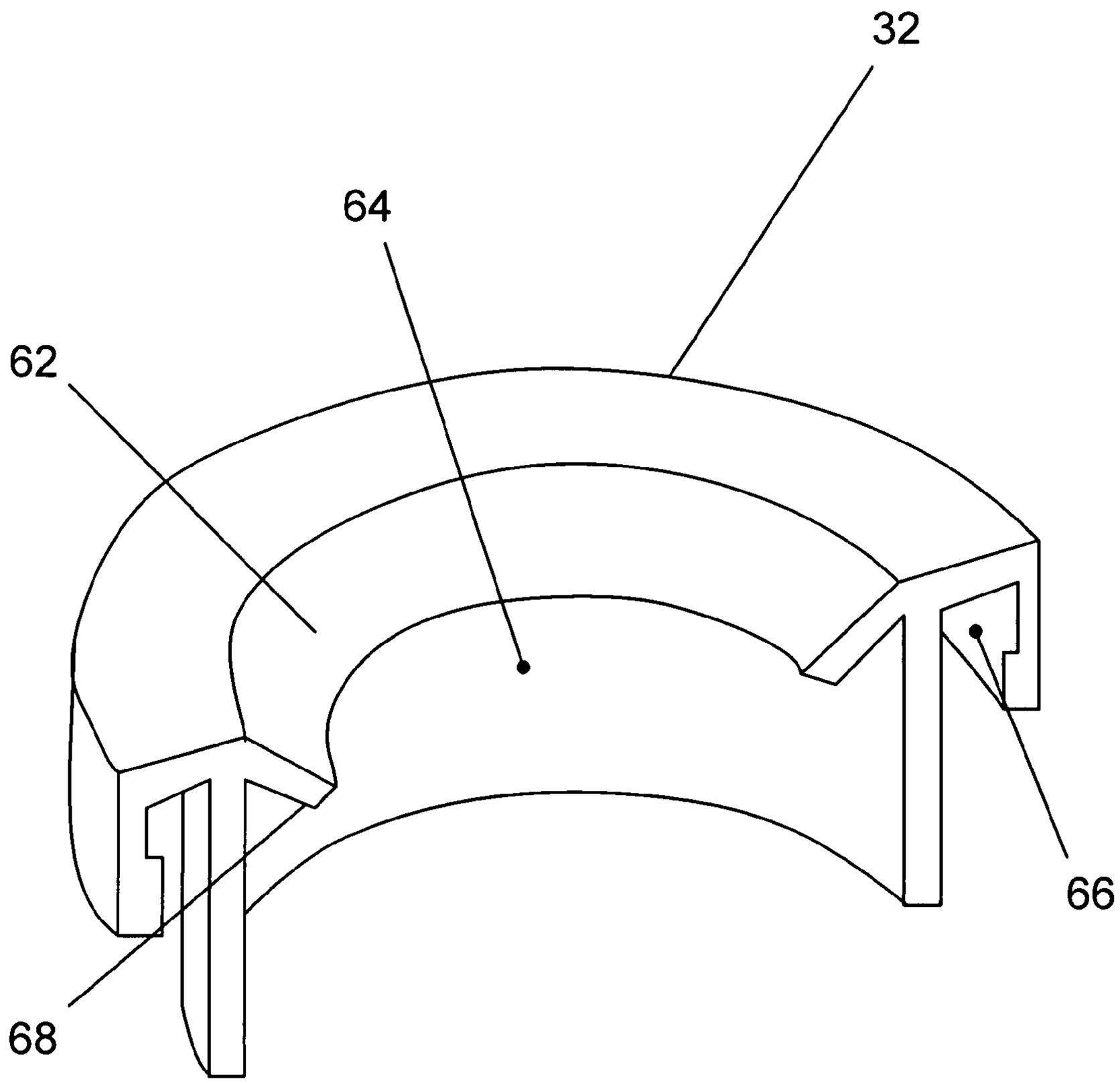


FIG. 6

BOW-TYPE SOFT PROJECTILE LAUNCHER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the field of soft projectile launching toys. More specifically the present invention comprises a bow-type soft projectile launcher.

2. Description of the Related Art

Projectile launchers have long been known as novelty items. These launchers typically fire potatoes, vegetable slices, marshmallows, tennis balls, and the like. Some are spring loaded, while others use pistons to compress a charge of air. They typically fire a small projectile which can be used in "mock combat" games without actually injuring the target. These devices have also found application other than as novelty items. Some have been used to fire marking projectiles in the veterinary and timber industries. Others have been used as pill injectors for treating horses and cows. Thus, although such projectile launchers are most often viewed as novelty items, their applications may be much broader.

Particularly, in mock combat situations it is desirable to limit the type of projectiles that may be "fired" from a projectile launcher to reduce the risk of injury. One particular concern in the field of novelty projectile launchers is the use of "improvised projectiles." Users of the launcher often attempt to use the launchers to launch hard projectiles which could cause injury

Accordingly, it would be beneficial to provide a projectile launcher which cannot be used to launch dangerous improvised projectiles and otherwise limits the risk of injury associated with the use of the projectile launcher.

BRIEF SUMMARY OF THE INVENTION

The present invention comprises a bow-type projectile launcher for launching soft projectiles. The projectile launcher features a pump assembly having a cylinder and piston. The piston is attached to a bow string so that a pressure charge is generated when the user draws and releases the bow string. The pressure charge is released into a chamber which contains a soft projectile. A removable magazine is provided for containing a plurality of soft projectiles. A magazine receiver is provided for attaching the removable magazine to the projectile launcher.

In the preferred embodiment, the pump cylinder has vents in the wall so that the pump assembly can deliver a more sudden pressure pulse to the soft projectile. The vents allow the piston to achieve greater velocity before compressing air into a pressure charge. The preferred embodiment further includes a muzzle projecting outwardly from the chamber and a muzzle brake with a plurality of brake vents. The brake vents prevent a user from inhaling a soft projectile through the muzzle of the projectile launcher.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** is a perspective view, showing the present invention

FIG. **2**A is an exploded view, showing components of the present invention.

FIG. **2**B is an exploded view, showing components of the present invention.

FIG. **3** is a section view, showing the present invention.

FIG. **4** is a section view, showing the present invention.

FIG. **5** is a front view, showing a chamber manifold.

FIG. **6** is a section view, showing a magazine receiver.

REFERENCE NUMERALS IN THE DRAWINGS

10	projectile launcher	12	pump assembly
14	pump grip	16	cylinder
18	vents	20	grip
22	limb	24	limb
26	barrel	28	muzzle brake
30	brake vents	32	magazine receiver
34	magazine	36	piston
38	grip assembly	40	chamber
42	cap	44	projectile receiving orifice
46	radius bend	48	projectile discharging orifice
50	bow string	52	projectiles
54	chambered projectile	56	apex
58	follow-up projectile	60	chamber vents
62	conical surface	64	magazine bore
66	chamber manifold receiver	68	seal tab

DETAILED DESCRIPTION OF THE INVENTION

The present invention is shown in its assembled state in FIG. **1**. Projectile launcher **10** includes pump assembly **12** which delivers pressure charge into a chamber to launch a soft projectile such as a marshmallow or a deformable foam pellet. The pump assembly includes cylinder **16** which contains a piston. One end of the piston projects out of the hollow interior of the cylinder and terminates at pump grip **14**. The pump is generally a positive displacement type pump that generates a pressure charge when the piston is drawn back and then pushed into cylinder **16**. Cylinder **16** has vents **18** along its wall. The purpose of vents **18** will be described in greater detail subsequently.

Projectile launcher **10** also includes grip **20** and limbs **22** and **24** which project outward away from grip **20**. Bow string **50** attaches to the ends of limb **22** and limb **24**. Bow string **50** also attaches to pump grip **14**. Bow string **50** transmits the stored energy of limbs **22** and **24** to pump assembly **12** when bow string **50** is drawn and then released.

Vents **18** on cylinder **16** serve a useful purpose which will now be considered in greater detail. When piston **36** is drawn back and then released, air within cylinder **16** provides resistance to the movement of piston **36** back into cylinder **16**. As the air is compressed it offers even more resistance. Vents **18** allow compressed air to escape out of cylinder **16** while piston **36** gains velocity traveling through cylinder **16**. Thus, vents **18** shorten the length of time the pump takes to accomplish a compression stroke and shorten the length of time over which the pressure charge is discharged into the chamber. This feature allows the pump to create a more "sudden" pressure pulse and launch the projectile further than if no vents were used.

Turning now to FIG. **2**, an exploded view of a bow-type projectile launcher is provided. It should be noted that FIG. **2** is merely an illustration of one embodiment of the invention, as the present invention may be fabricated in many different ways. Grip assembly **36** preferably comprises two pieces of molded plastic which attach around chamber **40**, barrel **26**, magazine receiver **32**, cylinder **16**, limb **22**, and limb **24**. As such, grip assembly **38** holds most of the assembly together.

FIG. **3** is a section view of several components of the bow-type projectile launcher. Chamber **40** is fluidly connected with the hollow interior of cylinder **16** so that chamber **40** receives the pressure charge generated by the pump. Turning to FIG. **5**, the reader will note that chamber **40** has a plurality of chamber vents **60** along its cylinder-facing wall which allow the pressure charge generated by the pump assembly to enter the chamber. Turning back to FIG. **3**, chamber **40** has projectile receiving orifice **44** in the top and pro-

jectile discharging orifice **48** in the front. A conduit extends between projectile receiving orifice **44** and projectile discharging orifice **48**. Radius bend **46**, having an approximately 90 degree bend, lies between projectile receiving orifice **44** and projectile discharging orifice **48**.

Barrel **26** is fluidly connected with projectile discharging orifice **48** extends away from chamber **40**. Muzzle brake **28** is attached to barrel **26**. Muzzle brake **28** has brake vents **30**. Vents **30** are formed by flanges that extend outwardly away from the bore of barrel **26**. Slots are provided between the flanges in the wall of barrel **26** to let air pass from the bore of barrel **26**, through the slots in barrel **26**, and then between the flanges of muzzle brake **28**. Muzzle brake **28** is a safety feature of the present invention. This feature prevents the user from placing their mouth around the muzzle of the projectile launcher and inhaling the soft projectile or discharging a pressure charge into the user's lungs. Brake vents **30** prevent the user from creating suction on the muzzle. If the user inhales through the end of muzzle brake **62**, air will simply filter through brake vents **30**. If the user puts the muzzle in a person's mouth, the pressure charge will be diverted through brake vents **30** and will not be forced into the person's lungs.

Magazine receiver **32** is positioned adjacent to projectile receiving orifice **44**. Magazine receiver **32** is configured to receive the open end of removable magazine **34**. Turning to FIG. **6**, the reader will note that magazine receiver **32** includes chamber manifold receiver **66** which receives the top of chamber **40** and forms an air-tight seal between magazine receiver **32** and chamber **40**. Magazine bore **64** passes through the center of magazine receiver **32**. Seal tab **68** having conical surface **62** extends into magazine bore **64**. Seal tab **68** allows for an air-tight seal to be formed between the outside of magazine **34** and the inside of magazine receiver **32**. Magazine receiver **32** is preferably made of a flexible material. When the pump delivers a pressure charge into the chamber, the pressure compresses the flexible portion of magazine receiver **32** (seal tab **68** in the present example) between the magazine and magazine receiver **32** so as to form an air tight seal. As air pressure increases, the seal becomes tighter, thus preventing magazine **34** from unintentionally launching out of the receiver when pressurized. This feature also prevents the pressure charge from escaping between magazine **34** and magazine receiver **32** during launching.

The reader will also notice that magazine receiver **32** allows for the detachment and quick removal of said magazine during reloading. To remove magazine **34**, the user simply grasps magazine **34** and pulls it out of magazine receiver **32**. The other end of magazine **34** is closed with cap **42**. Cap **42** includes a one-way valve. The one-way valve allows the vacuum caused by drawing back piston **36** to pull a projectile from magazine **34** into chamber **40**, but would prevent the pressure charge from being expelled through cap **42** when launching the projectile. Thus, although the pump pressurizes the magazine vessel, the one-way valve in the cap forces the pressure charge to exit out the barrel of the projectile launcher behind the projectile.

Turning to FIG. **4**, a magazine configured to contain a plurality of soft projectiles **52** in its hollow interior is shown. The reader will note that chambered projectile **54** comes to rest on apex **56** inside chamber **40**. When positioned in the chamber, chambered projectile **54** keeps follow-up projectile **58** inside magazine **34** so that follow-up projectile **58** does not interfere with the launching of chambered projectile **54**. Thus, the chamber geometry ensures that removable magazine **34** feeds only follow-up projectile **58** from the hollow interior of removable magazine **34** into chamber **40** after chambered projectile **54** is launched. The reader will also note that projectile discharging orifice **48** has a smaller diameter than soft projectiles **52**. This feature causes soft projectiles **52** to compress when entering barrel **26** and prevents the pressure charge from escaping around the soft projectile when the pressure charge is released into the chamber. This tapering of the inner diameter is also a safety measure which prevents "improvised" hard projectiles from forming a tight seal.

With the components of projectile launcher **10** now described, the user will appreciate how the launcher is used. The user first loads magazine **34** with soft projectiles **52**. The open end of magazine **34** is inserted into magazine receiver **32**. When held upright, chambered projectile **54** comes to rest on apex **56** in chamber **40** (the same result may be accomplished by the vacuum generated by the draw-back of string **50** and piston **36** even if the projectile launcher is not held upright as shown in FIG. **1**). The user draws back string **50** and piston **36** and then releases. The release of these components causes a pressure charge to be generated by pump assembly **12**. Vents **18** in cylinder **16** allow the piston to gain momentum before the pressure charge is released into chamber **40**. This pressure charge passes into chamber **40** and expels chambered projectile through barrel **26** and out of the launcher. The follow-up projectile then falls into place in chamber **40** and the process is repeated.

The preceding description contains significant detail regarding the novel aspects of the present invention. It should not be construed, however, as limiting the scope of the invention but rather as providing illustrations of the preferred embodiments of the invention. As an example, many different bow-type launchers could be designed incorporating the elements of the present invention. Such variations would not alter the function of the invention. Thus, the scope of the invention should be fixed by the following claims, rather than by the examples given.

The invention claimed is:

1. A projectile launcher allowing a user to launch a soft projectile having an external diameter, comprising:

a. a radius bend having an entrance, an exit, and an enclosed interior passing there between, said radius bend having an approximately 90 degree bend;

b. a projectile receiving orifice proximate said entrance;

c. a projectile discharging orifice located proximate said exit of said radius bend, wherein said projectile discharging orifice includes a taper and a smallest portion, with said smallest portion being smaller than said external diameter of said soft projectile, so that said soft projectile must compress in order to pass through said projectile discharging orifice;

d. at least one vent passing through said radius bend; and

e. a pump assembly fluidly connected to said at least one vent, said pump assembly including a piston having a pump grip configured to allow said user to grip and move said piston, said pump assembly being configured to blow compressed air through said at least one vent.

2. A projectile launcher as recited in claim **1**, further comprising a detachable magazine configured to hold a plurality of said soft projectiles.

3. A projectile launcher as recited in claim **2**, further comprising a magazine receiver proximate said projectile receiving orifice, with said magazine receiver being configured to receive said detachable magazine and form a substantially airtight seal between said projectile receiving orifice and said detachable magazine.

4. A projectile launcher as recited in claim **1**, further comprising:

a. a first bow limb connected to said radius bend;

b. a second bow limb connected to said radius bend, with said second bow limb extending outward in a direction that is opposite to a direction in which said first bow limb extends; and

c. a bow string connecting said first bow limb to said second bow limb, said bow string being additionally connected to said pump grip.

5. A projectile launcher as recited in claim 4, wherein said first bow limb includes a grip proximate said radius bend.

6. A projectile launcher as recited in claim 1, wherein:

a. said pump assembly includes a cylindrical housing defining a hollow interior which slidably mounts said piston, said cylindrical housing having a first end proximate said radius bend and a second end distal to said radius bend; and

b. wherein said cylindrical housing includes at least one lateral vent fluidly connecting said hollow interior to ambient air, said at least one lateral vent being located proximate said second end of said cylindrical housing.

7. A projectile launcher allowing a user to launch a soft projectile having an external diameter, comprising:

a. a pump assembly having a first end and a second end, including,

i. a piston slidably mounted within said pump assembly,

ii. said piston including a pump grip configured to allow said user to grip and move said piston,

iii. said pump assembly configured to discharge air compressed by said piston out said first end of said pump assembly;

b. a radius bend having an enclosed interior with an entrance and an exit an enclosed interior passing therebetween, said radius bend having an approximately 90 degree bend;

c. said entrance comprising a projectile receiving orifice for receiving one of said soft projectiles;

d. a projectile discharging orifice located proximate said exit of said radius bend, wherein said projectile discharging orifice includes a taper and a smallest portion, with said smallest portion being is smaller than said external diameter of said soft projectile, so that said soft projectile must compress in order to pass through said projectile discharging orifice; and

e. at least one vent passing through said radius bend, and connecting said enclosed interior to said second end of said pump assembly.

8. A projectile launcher as recited in claim 7, further comprising a detachable magazine configured to hold a plurality of said soft projectiles.

9. A projectile launcher as recited in claim 8, further comprising a magazine receiver proximate said projectile receiving orifice, with said magazine receiver being configured to receive said detachable magazine and form a substantially airtight seal between said projectile receiving orifice and said detachable magazine.

10. A projectile launcher as recited in claim 7, further comprising:

a. a first bow limb connected to said radius bend;

b. a second bow limb connected to said radius bend, with said second bow limb extending outward in a direction that is opposite to a direction in which said first bow limb extends; and

c. a how string connecting said first bow limb to said second bow limb, said bow string being additionally connected to said pump grip.

11. A projectile launcher as recited in claim 10, wherein said first bow limb includes a grip proximate said radius bend.

12. A projectile launcher as recited in claim 7, wherein:

a. said pump assembly includes a cylindrical housing defining a hollow interior which slidably mounts said piston, said cylindrical housing having a first end proximate said radius bend and a second end distal to said radius bend; and

b. wherein said cylindrical housing includes at least one lateral vent fluidly connecting said hollow interior to ambient air, said at least one lateral vent being located proximate said second end of said cylindrical housing.

13. A projectile launcher allowing a user to launch a soft projectile having an external diameter, comprising:

a. a pump assembly, including,

i. a cylinder, having a first end and a second end,

ii. a piston slidably mounted within said cylinder,

iii. said piston including a pump grip configured to allow said user to grip and move said piston,

iv. said cylinder and piston configured to discharge air compressed by said piston out said first end of said cylinder;

b. a chamber fluidly connected to said first end of said cylinder;

c. said chamber including a projectile receiving orifice for receiving one of said soft projectiles;

d. said chamber including a projectile discharging orifice, wherein said projectile discharging orifice includes a taper and a smallest portion, with said smallest portion being smaller than said external diameter of said soft projectile, so that said soft projectile must compress in order to pass through said projectile discharging orifice;

e. said chamber including a radius bend having an enclosed interior, with said enclosed interior connecting said projectile receiving orifice to said projectile discharging orifice, said radius bend having an approximately 90 degree bend; and

f. at least one vent passing through said radius bend, and connecting said enclosed interior to said first end of said cylinder.

14. A projectile launcher as recited in claim 13, further comprising a detachable magazine configured to hold a plurality of said soft projectiles.

15. A projectile launcher as recited in claim 14, further comprising a magazine receiver proximate said projectile receiving orifice, with said magazine receiver being configured to receive said detachable magazine and form a substantially airtight seal between said projectile receiving orifice and said detachable magazine.

16. A projectile launcher as recited in claim 13, further comprising:

a. a first bow limb connected to said chamber;

b. a second bow limb connected to said chamber, with said second bow limb extending outward in a direction that is opposite to a direction in which said first bow limb extends; and

c. a bow string connecting said first bow limb to said second bow limb, said bow string being additionally connected to said pump grip.

17. A projectile launcher as recited in claim 16, wherein said first bow limb includes a grip proximate said radius bend.

18. A projectile launcher as recited in claim 16, further comprising a detachable magazine configured to hold a plurality of said soft projectiles.

19. A projectile launcher as recited in claim 13, wherein said cylinder includes at least one lateral vent fluidly connecting an interior of said cylinder to ambient air, said at least one lateral vent being located proximate said second end of said cylinder.

20. A projectile launcher as recited in claim 19, further comprising a detachable magazine configured to hold a plurality of said soft projectiles.

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